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Gordon W. Gow

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## **The Importance of Innovation to Canada in the World Competitive Context**

*Gordon W. Gow\**

**I** would like to bring a Canadian perspective to the importance of innovation as the major competitive factor in today's global economy. I will review Canada's overall performance in promoting innovation, some of the challenges we face and some of the solutions that are at hand. In particular, I will discuss some of the initiatives taken by the Province of Ontario to promote scientific and technological innovation both within our own jurisdiction and across Canada.

It is increasingly clear that a nation's economic performance depends on its efforts to support and sustain innovation. Today, more than ever before, our ability to compete in international markets depends on our ability to use our heads rather than our hands. While the economic importance of technology is by no means new, we have only just begun to recognize the strong links between technological innovation and productivity during the past twenty years or so.

Various economic studies have indicated that as much as 80% of a nation's productivity growth can be attributed to technological innovation. A recent Canadian study has shown, for example, that the rate of return on industrial research and development ("R&D") investment in Canada is about 60%. That is well above the rate of return on most other investments.

These improvements in industrial productivity may come in the form of new or improved products or reductions in the costs of production. Either way, investments in industrial R&D can play a major role in improving a country's overall competitiveness. That is why countries all over the world are increasing their support for technological innovation.

This growing recognition of the importance of innovation parallels an earlier recognition of the benefits of literacy and mass education. In a sense, R&D is the most advanced form of education. Just as the "three Rs" were instrumental in the spread of the Industrial Revolution, R&D, the fourth "R," has become the key to competitiveness in the new global economy.

As was the case with mass education, it is clear that the government has a crucial role to play in promoting innovation as a means of achieving greater economic productivity and international competitiveness. Government action may include such measures as:

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\* Deputy Minister, Ontario Ministry of Industry, Trade and Technology.

- 1) Encouragement and support for increased R&D;
- 2) Promotion of greater collaboration between industry, academia and government on R&D; and
- 3) Development of a technologically skilled workforce capable of developing and adapting to new technologies.

Government expenditures in these areas are necessary to create a nation's technological infrastructure, just as funding for transportation and communications networks creates a nation's physical infrastructure. In the vital area of R&D, for example, the invisible hand of the market will not, by itself, allocate enough investment resources into basic and industrial R&D to maximize productivity growth. This is because the costs and risks of R&D are all too often carried by a single firm while the benefits are often spread over a wide number of firms, to the general benefit of society as a whole.

Under these circumstances, the governments of most industrial nations have recognized that they must share in the costs and risks of R&D investment by providing incentives to industry. In return, the nation achieves higher overall productivity growth and improved competitive strengths in international markets.

In Canada, there is a growing recognition of the importance of scientific and technological innovation as the key to our country's future economic prosperity. With that has come a realization that Canada lags far behind other advanced industrial countries in expenditures on R&D as a percentage of its gross domestic product ("GDP"). Of the twelve leading countries of the Organization for Economic Cooperation and Development ("OECD"), Canada ranks tenth — with R&D expenditures amounting to only 1.35% of its GDP, less than half of that spent by the United States. Equally worrisome is the fact that Canadian expenditures on industrial R&D have only recently begun to represent more than 50% of total R&D in Canada. In most other industrial countries, industrial R&D accounts for 60-70% of total R&D spending.

Over the years, Canada's low R&D performance has been attributed to a number of structural problems within the Canadian economy. These problems include the relatively small size of Canadian firms, dependence on resource industries, limited access to foreign markets, the high degree of foreign control of Canadian industry and the low level of government support for R&D.

While all of these factors provide some clues to Canada's relatively poor performance, foreign control of our industries and the lack of government support for R&D appear to be the major causes for concern. Various studies have shown that foreign-controlled firms in Canada spend much less on R&D than their Canadian-owned counterparts. For example, in 1984, Canadian-controlled companies spent an average of 1.5% of sales on R&D, while their foreign-owned competitors spent less than 1%. The difference is even more startling in Canada's more technology intensive industries, where foreign control is higher than in most

sectors. In the aircraft industry, for instance, Canadian-controlled companies spent 19% of sales on R&D while their foreign-controlled counterparts spent about 5%. However, the R&D performance of Canadian-controlled companies compares favorably with their counterparts in U.S. industry.

Canadian federal and provincial governments provide a much lower level of support for industrial R&D than the U.S. government. A 1987 OECD study showed that the United States directly funds 34% of industrial R&D while Canada funds only 12%. Canada's more generous tax incentives for R&D alleviate less than one-third of this 22% difference. Much of the U.S. government's support for industrial R&D is channeled through its vast defense procurement programs. This option is not realistic for Canada, since our defense programs are much smaller and limited in scope than the U.S. ones. There is also a growing debate about how effective defense-related R&D expenditures really are in raising a country's overall industrial productivity.

Regardless of such international comparisons, there is no doubt that, for Canada, a substantial increase in R&D investment, especially industrial R&D, is a major economic priority. In 1987, the federal and provincial governments recognized this when they signed the National Science and Technology Policy and formed the Council of Science and Technology Ministers.

Later that year, the Province of Ontario presented an action plan to further strengthen this policy and put Canada in step with other advanced OECD nations. The major goal of the plan was to increase Canada's national R&D investment to 2.5% of GDP in ten years. In addition, the plan set out realistic R&D targets for government, industry and the academic research community. Unfortunately, the federal government has been reluctant to adopt this plan and has, instead, steadily reduced its real expenditures on R&D in each of the past three years.

In the meantime, Ontario has forged ahead with the development of its own policies to promote innovation and has backed these policies with substantial increases in funding. Ontario's rapidly increasing expenditures in this area have been guided by two major themes:

- 1) The need to develop Ontario's science and technology capabilities so that we can compete with the best in the world; and
- 2) The need to promote cooperative R&D efforts among the private sector, universities and government.

A vital first step in this endeavor was the creation of the Premier's Council, which brought together leaders from business, labor, government and the academic community. The mandate of the Council was to advise the government on future industrial strategies to make Ontario a world leader in trade, technology and innovation.

As its first task, the Council undertook a wide-ranging study that examined the international competitiveness of several important Ontario

industries and the capabilities of our educational, science and technology infrastructure. Its main finding was that Ontario can no longer depend on its traditional resource-based and primary manufacturing industries to sustain its economic growth. Instead, the Council said that Ontario's future prosperity will depend on developing high growth, high value-added industries whose success in international trade will be based on technological innovation, skilled labor, high productivity and aggressive marketing.

The Council has recommended measures to stimulate advanced R&D, enhance the skills of our work force and encourage investment in promising new industries as well as the restructuring of our established industries. To implement some of these measures the government set up a \$1 billion technology fund, which has become the primary vehicle for supporting technological innovation and development. For example, we have introduced an industry research program which will account for about half of the technology fund's expenditures over the next ten years. To date, the Council has committed almost \$90 million from this program to fifteen R&D projects in areas of economic importance to Ontario. All of them involve close collaboration between private companies, universities and research institutions. Last year we also introduced new tax incentives to support increased investment in industrial R&D by both large and small businesses. The value of these incentives is expected to be nearly \$300 million over the first five years. In addition, we are currently developing a technology procurement program that will award enabling research contracts to Ontario companies capable of becoming suppliers of high-technology goods and services to the Ontario government and its agencies, such as Ontario Hydro.

We are also promoting increased cooperation between Ontario industries and universities, which carry out most of Ontario's basic scientific research. The first major step in this direction was the establishment, in 1987, of seven R&D networks, known as Centres of Excellence. Seven Ontario universities and nearly 100 companies are involved in the Centres of Excellence, which are supported with \$204 million from the technology fund. In addition, we have set up a university incentive fund which matches private industry funding for research projects at universities. To date, the government has approved more than \$21 million in funding for 246 projects at fourteen Ontario institutions.

We have also introduced a number of new measures to help small and medium-sized businesses gain the benefits of increased R&D. For example, we are in the process of establishing a technology personnel program which provides financial assistance to small and medium-sized Ontario firms to hire the engineering and technical staff required to carry out their own R&D programs.

Not all of Ontario's support for innovation is geared to the development of new products and processes. It is also being used to improve our

existing educational and skills training programs to help Ontario meet the challenges of global competition. Since 1986, we have begun introducing a number of new skills training programs intended to help our industries develop the skilled labor force required to fully utilize new technologies on the shop floor and in the office. But we also believe that the private sector has a crucial role to play in the development of a technologically educated and skilled work force. For industry, investments in training, like investments in R&D, can lead to increases in productivity that promise a substantial rate of return.

There is much that industry in both Canada and the United States can learn from the Europeans and the Japanese, who have recognized the vital importance of skills training as a major factor in productivity and international competitiveness. The advantages we may gain through increased R&D could come to nothing if we lack the educated and trained people who can take these innovations from the laboratory to the marketplace.

The Ontario government is moving on a number of fronts to improve our capacity for technological innovation and development. Each of the programs described represents a long-term investment in Ontario's economy. Such investments in innovation are vital to our future economic prosperity. It is today's technology-driven industries that are increasingly responsible for creating new economic wealth and prosperity.

There is no question that innovation and new technologies will be a central feature of our economic future. Broad consensus has been achieved on the benefits of research and innovation to our economy and to our citizens. My experience in both the private sector and government tells me that awareness can only lead to better results. Ontario will continue to be a leader in new technologies, and innovation will continue to be a mainstay of our economic growth and strength.

